ORDER NO. AD8904101C8

# Service Manual

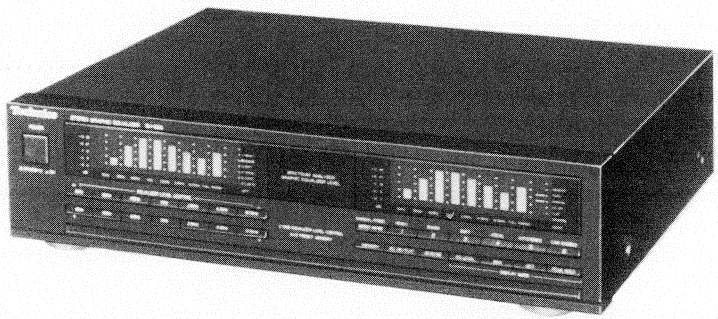
Equalizer

## Stereo Graphic Equalizer

# SH-E65

**Color**

(K)... Black Type



**Area**

| Country Code | Area | Color |
|---|---|---|
| (E), (E5) | Continental Europe | (K) |
| (EB) | Great Britain | (K) |
| (EG) | F.R. Germany & Italy | (K) |
| (GC) | Third Region | (K) |
| (GN) | New Zealand | (K) |

## SPECIFICATIONS

**(DIN 45 500)**

**Frequency response (center position)** : 5 Hz~100 kHz (−3 dB)
**Maximum output voltage** : 8 V (1 kHz, THD 0.03%)
**Rated output voltage** : 1 V
**Maximum input voltage** : 8 V (1 kHz)
**Input sensitivity** : 1 V
**Rated total harmonic distortion** : 0.005% (20 Hz~20 kHz), at 1 V output
0.003% (1 kHz), at 1 V output
**Signal-to-noise ratio** : 98 dB/1 V (105 dB/1 V, IHF'A)
**Input impedance** : 47 kΩ
**Gain** : 0±1 dB
**Channel balance 250 Hz~6300 Hz** : ±0.5 dB
**Channel separation 1 kHz** : 70 dB

**Equalization-level controls** : +12 dB~−12 dB
(7 frequency ranges, in 2-dB steps)
**Center frequencies** : 63 Hz, 160 Hz, 400 Hz, 1 kHz, 2.5 kHz, 6.3 kHz, 12.5 kHz

### GENERAL

**Power supply** : For Great Britain and New Zealand: AC 50/60 Hz, 240 V
For Third Region: AC 50/60 Hz, 110 V/127 V/220 V/240 V
For Continental Europe, F.R. Germany and Italy: AC 50/60 Hz, 220 V
**Power consumption** : 11 W
(with power switch at STANDBY: 6.5 W)
**Dimensions (W×H×D)** : 360×91×280 mm
(14 3/16" × 3 19/32" × 11 1/32")
**Weight** : 2.8 kg (6.2 lb)

**Notes:**
1. Specifications are subject to change without notice. Weight and dimensions shown are approximate.
2. Total harmonic distortion is measured by the digital spectrum analyzer.

Technics

**Matsushita Electric Industrial Co., Ltd.**
Central P.O. Box 288, Osaka 530-91, Japan

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# ■ ACCESSORIES

- Stereo connection cables ..... 2
  (SJP2249-3)
- AC power supply cord ..... 1
  SFDAC05E03.....(E), (EG), (E5)
  SJA188.....(EB)
  SJA190.....(GN)
  RJA0004.....(GC)
- L-type cable ..... 1
  (SJP2257T)

# ■ CONNECTIONS

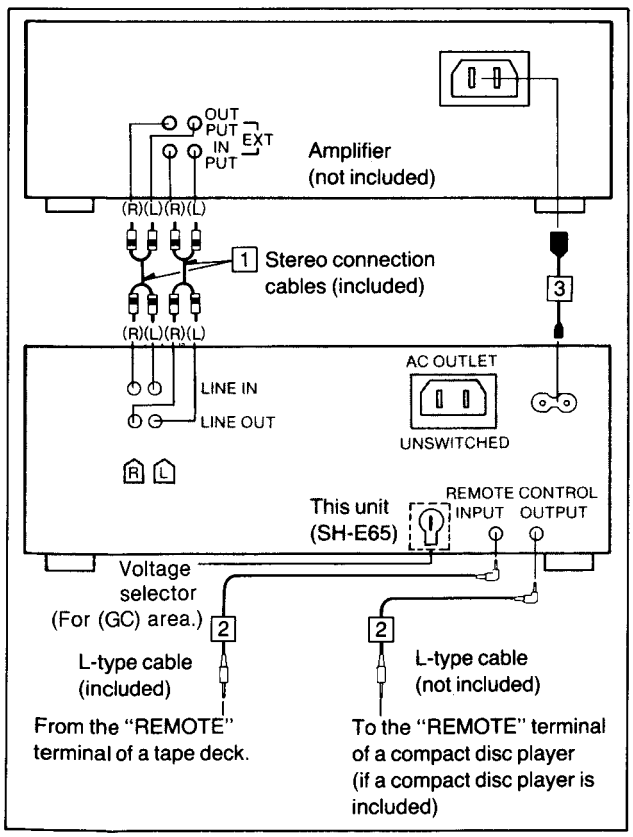
**This is an equalizer that provides effects both during tape recording and playback if it is used while connected to an amplifier that has "EXT IN/OUT" terminals.**
**If this unit is connected to an amplifier that does not have "EXT IN/OUT" terminals, its effects are limited to playback only.**

Make connections in the numbered sequence by using the included cables.

**1 Connect the stereo connection cables.**

**2 Connect the L-type cables.**

**3 Connect the AC power supply cord.**




The illustration at the left shows an example of connections made when this unit is combined with a Technics hi-fi component system, and shows only the connections to be made to and from this unit in that combination.
Refer to the illustration together with the instructions provided below.

### "REMOTE CONTROL INPUT" terminal

Make a connection from this terminal to the "REMOTE" terminal of a cassette deck.
(For detailed information, refer to the operating instructions of the Technics receiver or the Technics amplifier).

### "REMOTE CONTROL OUTPUT" terminal

Make a connection from this terminal to the "REMOTE" terminal of a Technics compact disc player.
(For detailed information, refer to the operating instructions of the Technics compact disc player.)

### "AC OUTLET"

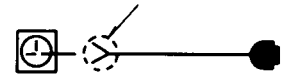
This outlet is a unswitched outlet.
Power is always available, regardless of unit's power switch setting.
This outlet is only for use with other audio equipment.
Also, do not exceed the indicated power rating when connecting to this outlet.

### AC power supply cord (3)

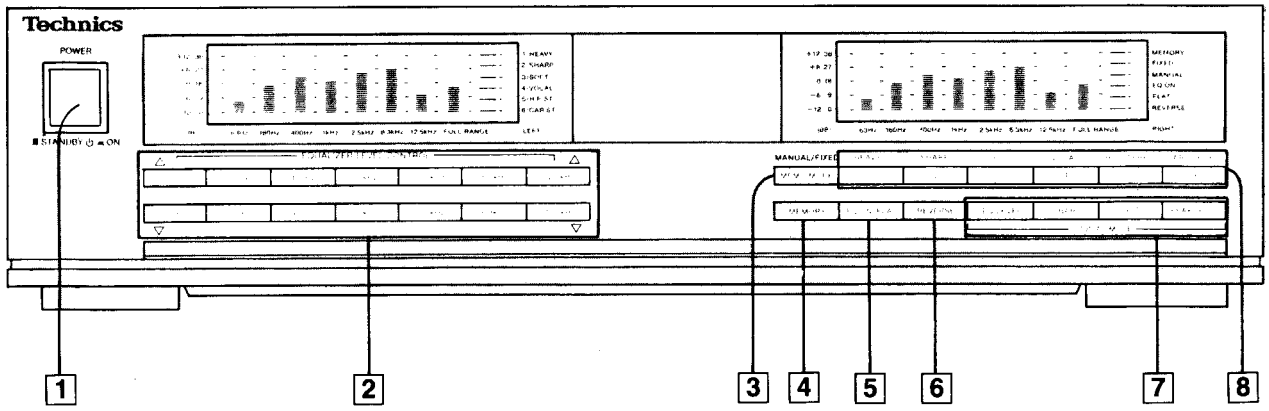
To the AC outlet of the audio equipment, or household AC outlet.
① Connect this cord only after all other cables and cords have been connected.

If the cord is to be connected to the household AC outlet, cut off and dispose of the plug and replace with a suitable plug. (Refer to "For Great Britain".)
② Fit a suitable plug to an AC power supply cord.

Household AC outlet



# ■ FRONT PANEL CONTROLS AND FUNCTIONS




## Control section

### 1 Power "standby ⏻ /on" switch (power "standby ⏻ /on")

This switch switches ON and OFF the secondary circuit power only. The unit is in the "standby" condition when this switch is set to the "standby ⏻ " position. Regardless of the switch setting, the primary circuit is always "live" as long as the power cord is connected to an electrical outlet.

**Note:**

- For this unit, even if this switch is switched to the "STANDBY" position, there is still a slight power consumption of about 6.5 watts; this is in order to assure the retention of the "most recent" memory and the preset-memory functions.

**"Power-through" function**

Discs, radio broadcasts, etc. can be heard even if the power of this unit is switched to STANDBY.
Note, however, that the power plug should be left connected to the AC outlet.

### 2 Equalizer level-control buttons (EQUALIZER LEVEL CONTROL)

These buttons are used for adjustment of the equalization level of the left channel and right channel simultaneously.

**Upper row:** These buttons are used to increase the level of each sound range (frequency range).

**Lower row:** These buttons are used to reduce the level of each sound range (frequency range).

### 3 Memory mode-select button (MEMO MODE)

This button is used to select the equalization memory mode to be used.

**MANUAL:** Select this mode to program a desired curve to the unit's memory or to retrieve a curve that you have programmed.

**FIXED:** Select this mode to retrieve a curve that was originally pre-programmed to the unit's memory.

### 4 Memory button (MEMORY)

This button is used to program the equalization curve into the memory.

### 5 Equalization mode-select button (EQ ON/FLAT)

This button is used to switch the equalization correction function "EQ ON" and "FLAT". Each time a button is pressed, the mode changes alternately to one or the other of the following modes.

**EQ ON:** Select this mode to make an equalization correction.

**FLAT:** Select this mode if no equalization correction is desired.

Note that the "EQ ON" mode is automatically selected if a preset-memory button or an equalizer level-control button is pressed while this button is set to the "FLAT" mode.

### 6 Reverse button (REVERSE)

This button is used to reverse the equalization curve shown in the display.

### 7 Display mode-select buttons (DISPLAY MODE)

These buttons are used to select the equalization-level display mode and any of the three types of spectrum display mode described below.

#### ■ Equalization-level display mode

**EQ LEVEL:** Select this mode when you want to display the equalization level.

#### ■ Spectrum display modes

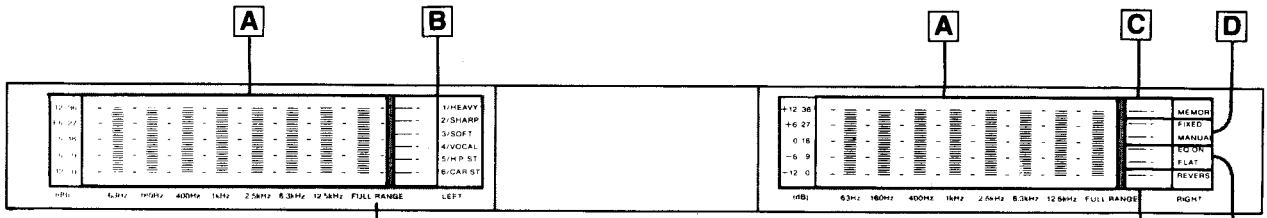
**BAR:** Select this mode when you want a bar-type display.

**DOT:** Select this mode when you want a dot-type display.

**PEAK HOLD:** Select this mode when you want the peak to be held in the display.

### 8 Preset-memory buttons (1–6, HEAVY—CAR STEREO)

These buttons are used to program an equalization curve into the memory, or to retrieve a curve originally programmed into the unit's memory of a curve that you have programmed into the memory.



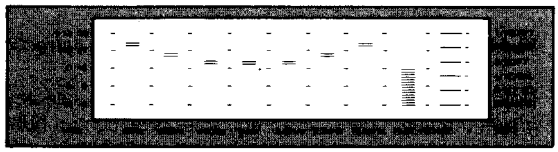

## Display section

### A Equalization/Spectrum display

The following equalization-level display and three types of spectrum display are possible.

#### ■ Equalization-level display

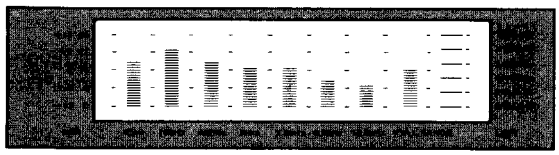
The amount of correction is displayed by a series of lines (=) for each sound range (frequency range).



#### ■ Spectrum displays

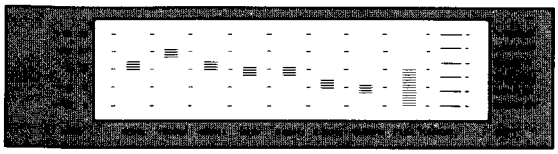
**Bar-type display**

This display can be used to show the strength of the sound being emitted from the speaker systems for each sound range (frequency range), and to show the strength of sound for all ranges (FULL RANGE) by a bar-type display.



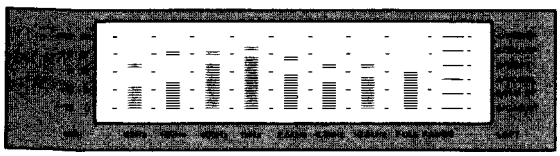
**Dot display**

Only the upper two parts of the bar display are shown, thus making the strength of the sound for each sound range even easier to see.



**Peak-hold display**

The peak sound value of each sound range is held on the display for about two seconds after it occurs.



**Note:**
If an equalization level-control or the memory-mode selector or a preset-memory button is pressed during any display other than the equalization-level display, the equalization-level display will be shown for about five seconds, after which the former display will return.

### B Equalization-preset indicators

The indicator corresponding to the pressed preset-memory button will illuminate.

**1–6:** Indicates an equalization curve that you programmed into the memory.

**HEAVY-CAR ST.:** Indicates one of the six equalization curves that were originally programmed into the memory.

### C Equalization-memory indicator (MEMORY)

This indicator illuminates when the memory button is pressed, thus indicating that an equalization curve can be programmed into the memory.

### D Memory-mode indicators

**FIXED:** Indicates that one of the equalization curves that were originally programmed into the memory can be retrieved.

**MANUAL:** Indicates that an equalization curve that you programmed into the memory can be retrieved.

### E Equalization-mode indicators

**EQ ON:** Indicates that the equalization effect has been switched ON.

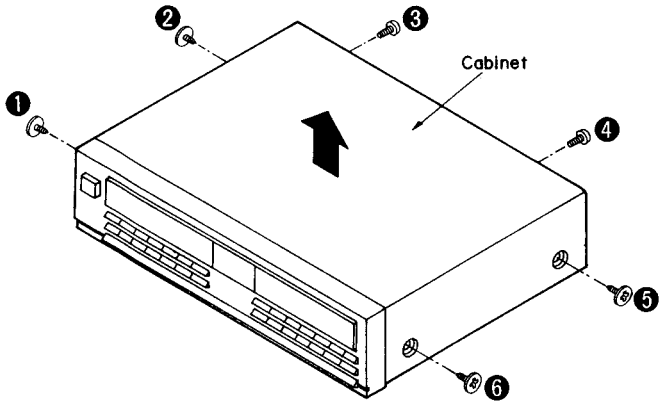
**FLAT:** Indicates that the equalization effect has been switched OFF.

### F Reverse indicator (REVERSE)

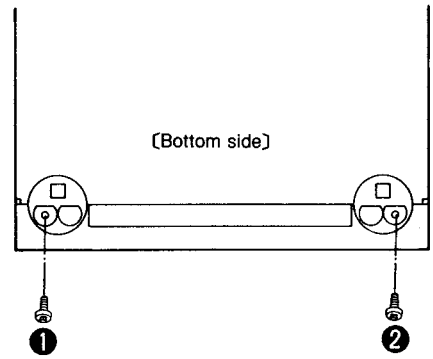
This indicator illuminates when the reverse button is pressed, thus indicating that an equalization curve is reversed.
Note, however, that there will be no illumination if the equalization curve is flat.

# ■ DISASSEMBLY INSTRUCTIONS

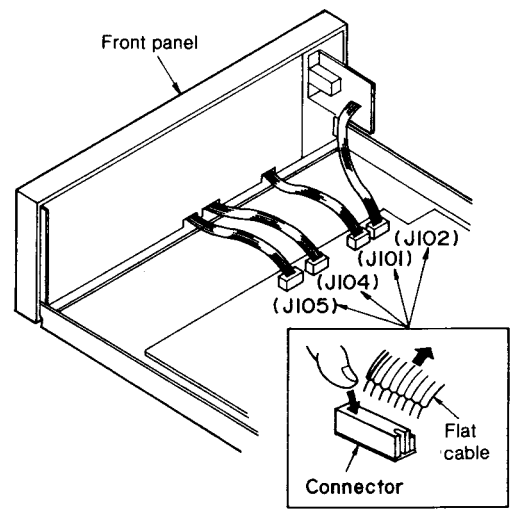
| Ref. No. 1 | Removal of the cabinet |
|---|---|
| Procedure 1 | • Remove the 6 screws (❶~❻). |



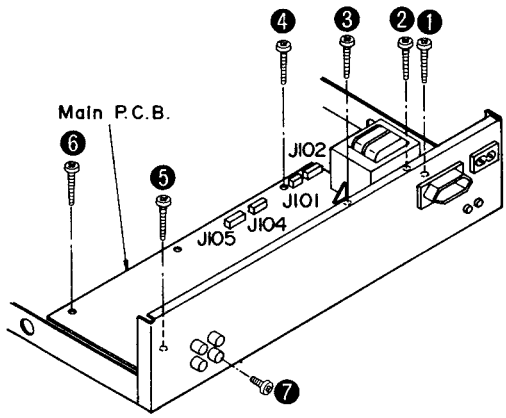

| Ref. No. 2 | Removal of the front panel |
|---|---|
| Procedure 1→2 | 1. Remove the 2 screws (❶, ❷). |



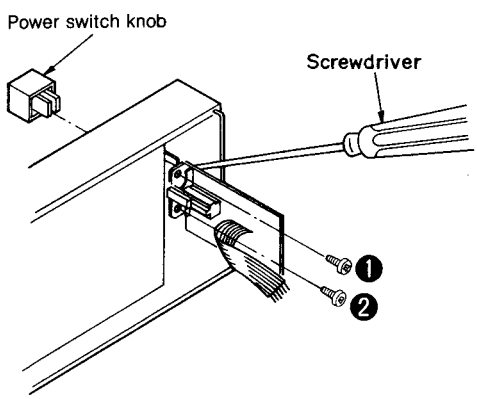

2. Remove the 4 flat cables (J101, J102, J104, J105).



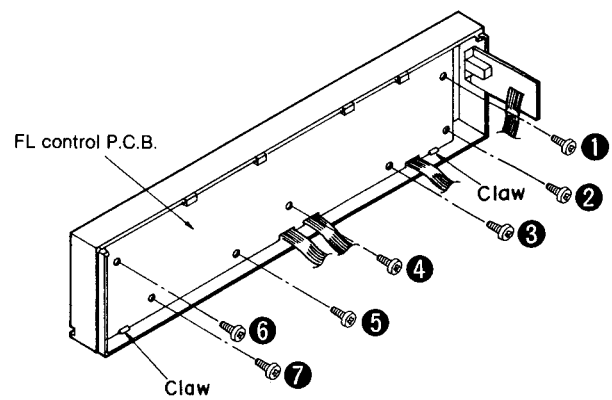

| Ref. No. 3 | Removal of the main P.C.B. |
|---|---|
| Procedure 1→3 | 1. Remove the 7 screws (❶~❼).<br>2. Remove the 4 flat cables (J101, J102, J104, J105). |




| Ref. No. 4 | Removal of the power switch P.C.B. |
|---|---|
| Procedure 1→4 | 1. Remove the power switch knob by pushing it from behind the front panel.<br>2. Remove the 2 screws (❶, ❷). |




| Ref. No. 5 | Removal of the FL control P.C.B. |
|---|---|
| Procedure 1→2→5 | 1. Remove the 7 screws (❶~❼).<br>2. Release the 2 claws. |



# ■ FUNCTIONS OF IC TERMINALS

## • IC301 (HD614042SJ14): Microcomputer

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 1 | j (R) | O | +6dB segment output to FL meter. (Rch) |
| 2 | k (R) | O | +8dB segment output to FL meter. (Rch) |
| 3 | l (R) | O | +10dB segment output to FL meter. (Rch) |
| 4 | m (R) | O | +12dB segment output to FL meter. (Rch) |
| 5 | a (L) | O | −12dB segment output to FL meter. (Lch) |
| 6 | b (L) | O | −10dB segment output to FL meter. (Lch) |
| 7 | c (L) | O | −8dB segment output to FL meter. (Lch) |
| 8 | d (L) | O | −6dB segment output to FL meter. (Lch) |
| 9 | e (L) | O | −4dB segment output to FL meter. (Lch) |
| 10 | f (L) | O | −2dB segment output to FL meter. (Lch) |
| 11 | g (L) | O | 0dB segment output to FL meter. (Lch) |
| 12 | h (L) | O | +2dB segment output to FL meter. (Lch) |
| 13 | i (L) | O | +4dB segment output to FL meter. (Lch) |
| 14 | j (L) | O | +6dB segment output to FL meter. (Lch) |
| 15 | k (L) | O | +8dB segment output to FL meter. (Lch) |
| 16 | l (L) | O | +10dB segment output to FL meter. (Lch) |
| 17 | m (L) | O | +12dB segment output to FL meter. (Lch) |
| 18 | ADI | I | A/D input, high withstand voltage. |
| 19 | VDISP | I | Connected to power supply (−33.4V). |
| 20 | NC | O | Not used. |
| 21 | NC | O | Not used. |
| 22 | INTO | I | Not used, connected to power supply (5.1V). |
| 23 | INTI | I | Not used, connected to power supply (4.4V). |
| 24 | AD0 | O | A/D conversion data output. |
| 25 | AD1 | O | A/D conversion data output. |
| 26 | AD2 | O | A/D conversion data output. |
| 27 | AD3 | O | A/D conversion data output. |
| 28 | AD4 | O | A/D conversion data output. |
| 29 | AD5 | O | A/D conversion data output. |
| 30 | AD6 | O | A/D conversion data output. |
| 31 | AD7 | O | A/D conversion data output. |
| 32 | VCC | I | 5V power supply. |

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 33 | SCK | I | Remote control data. Communication data clock input. |
| 34 | SD | I | Remote control data. Communication data input. |
| 35 | MUT1 | O | Not used, connected to power supply (+4.8V). |
| 36 | MUT2 | O | Muting output. |
| 37 | VOLD | O | Data signal of Band Level output. |
| 38 | VOLC | O | Clock signal of Band level output. |
| 39 | CS (L) | O | Inhibit data signal output to MPX. (Lch) |
| 40 | CS (R) | O | Inhibit data signal output to MPX. (Rch) |
| 41 | A | O | MPX data output. |
| 42 | B | O | MPX data output. |
| 43 | C | O | MPX data output. |
| 44 | CS | O | Data signal output to FL DRIVE. |
| 45 | NC | I | Not used, open. |
| 46 | K3 | I | Key scan signal input. |
| 47 | K2 | I | Key scan signal input. |
| 48 | K1 | I | Key scan signal input. |
| 49 | RESET | I | Reset signal input. |
| 50 | TEST | — | Test terminal (Connected to power supply 5V). |
| 51 | OSC1 | I | Clock signal input. |
| 52 | OSC2 | O | Clock signal output. |
| 53 | GND | I | Grounding. |
| 54 | K01 | O | Key scan signal output. |
| 55 | K02 | O | Key scan signal output. |
| 56 | i (R) | O | +4dB segment output to FL meter. (Rch) |
| 57 | h (R) | O | +2dB segment output to FL meter. (Rch) |
| 58 | g (R) | O | 0dB segment output to FL meter. (Rch) |
| 59 | f (R) | O | −2dB segment output to FL meter. (Rch) |
| 60 | e (R) | O | −4dB segment output to FL meter. (Rch) |
| 61 | d (R) | O | −6dB segment output to FL meter. (Rch) |
| 62 | c (R) | O | −8dB segment output to FL meter. (Rch) |
| 63 | b (R) | O | −10dB segment output to FL meter. (Rch) |
| 64 | a (R) | O | −12dB segment output to FL meter. (Rch) |

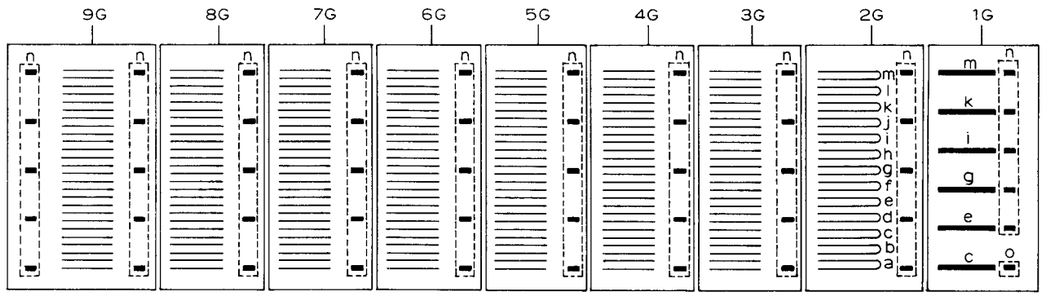
## • IC56 (LC6528C3664): Microcomputer

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 1 | OSC1 | I | OSC input. |
| 2 | TEST | — | Not used, connected to GND. |
| 3 | $V_{SS}$ | — | Grounding. |
| 4 | RES | I | MCU reset terminal. |
| 5 | PA0 | — | Custom code data. |
| 6 | PA1 | — | Custom code data. |
| 7 | PA2 | — | Custom code data. |
| 8 | PA3 | — | Custom code data. |
| 9 | $V_{DD}$ | I | 4.8V power supply. |

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 10 | PC0 | — | Custom code data. |
| 11 | PC1 | — | Not used, connected to GND. |
| 12 | PC2 | I | Remote control data input. |
| 13 | PC3 | — | Not used, connected to GND. |
| 14 | PD0 | — | Not used, open. |
| 15 | PD1 (SD) | O | Remote control data output. |
| 16 | PD2 (SCK) | O | Remote control data clock output. |
| 17 | PD3 | — | Not used, connected to GND. |
| 18 | OSC2 | — | Not used, open. |

# ■ DESCRIPTION OF FL PANEL

## • GRID ASSIGNMENT

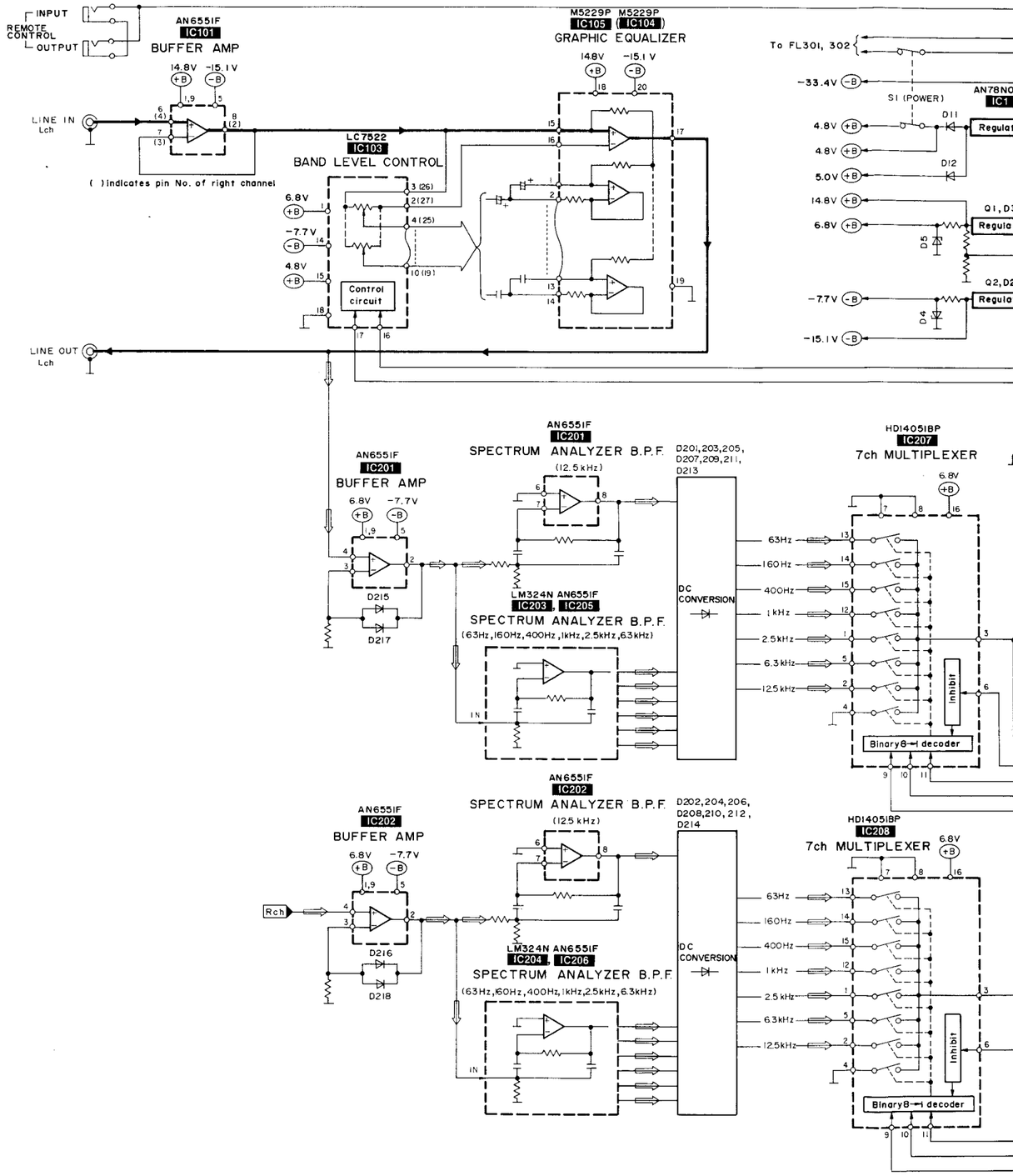



## • PIN CONNECTION

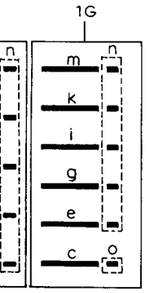
| Pin No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Connection | F1 | F1 | NP | NP | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | NP |
| Pin No. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | |
| Connection | NP | NP | NP | NP | NP | NP | 1G | 2G | 3G | 4G | 5G | 6G | 7G | 8G | 9G | NP | NP | F2 | F2 | |



# ■ BLOCK DIAGRAM

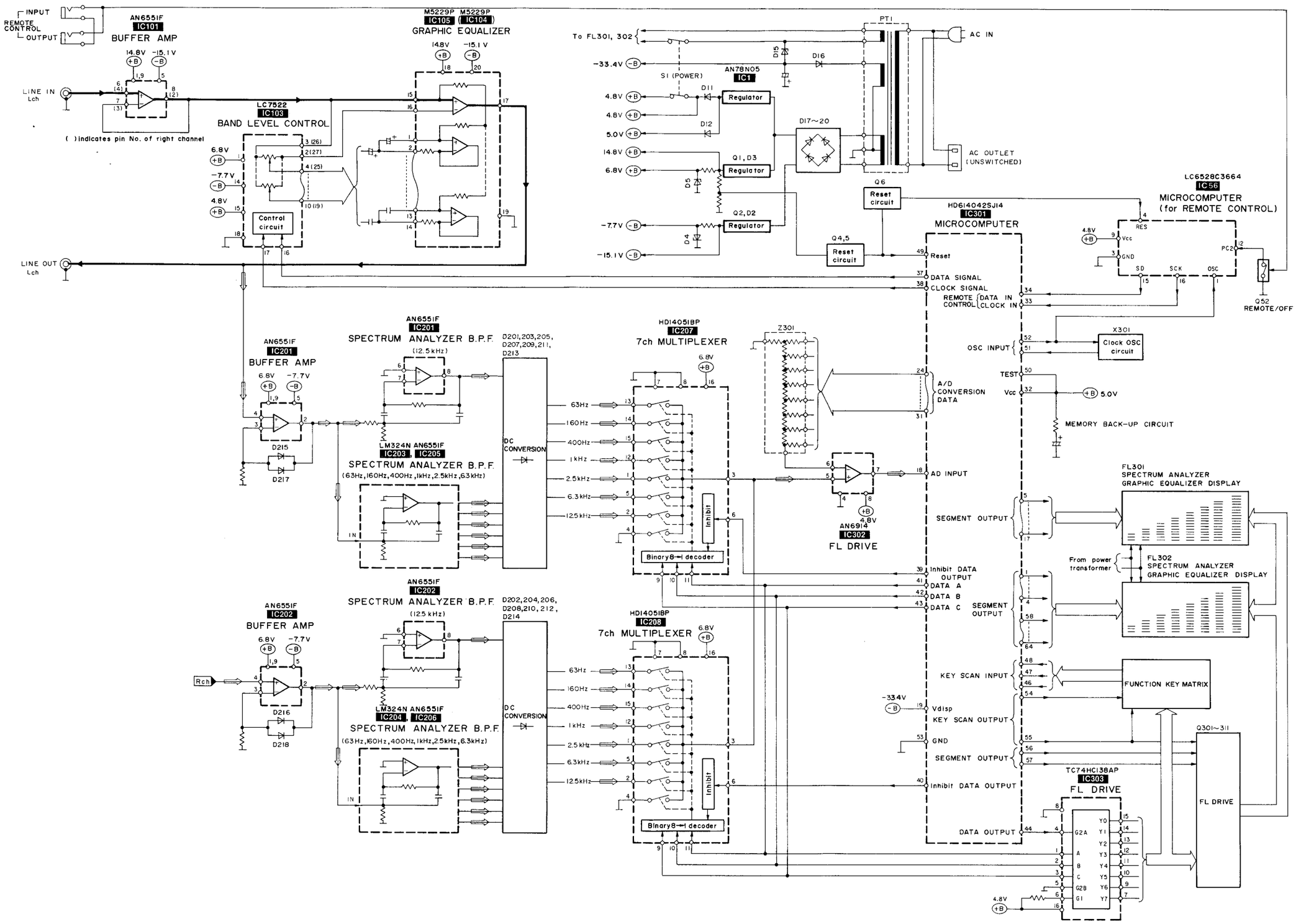


| ction |
|---|
| |
| o GND. |
| nput. |
| o GND. |
| |
| utput. |
| lock output. |
| o GND. |
| |

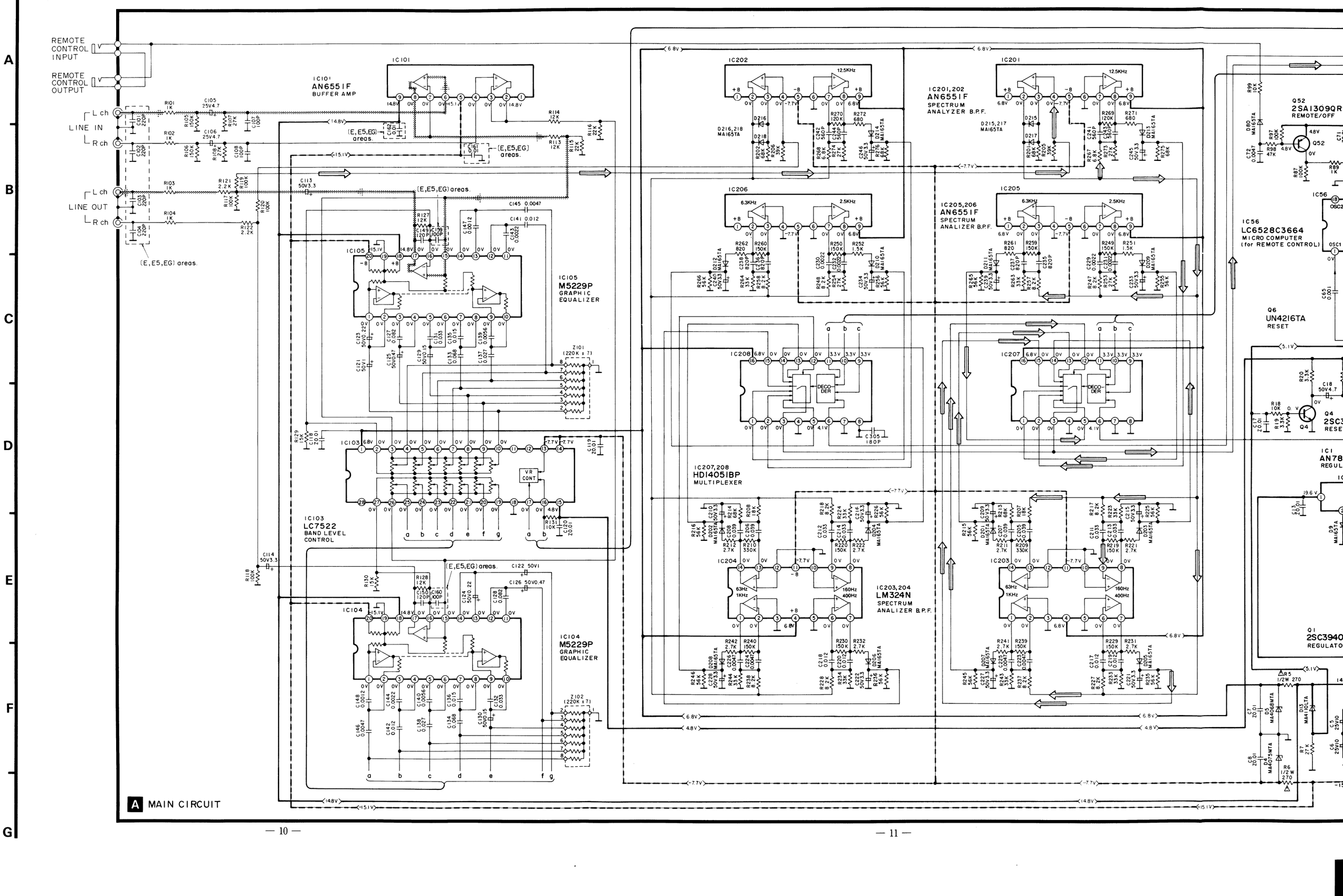



| 18 | 19 | 20 |
|---|---|---|
| n | o | NP |
| 38 | 39 | |
| F2 | F2 | |

# ■ BLOCK DIAGRAM



SH-E65 SH-E65


REMOTE CONTROL INPUT
REMOTE CONTROL OUTPUT
LINE IN L ch R ch
LINE OUT L ch R ch
(E,E5,EG) areas.
IC101 AN6551F BUFFER AMP
IC105 M5229P GRAPHIC EQUALIZER
IC103 LC7522 BAND LEVEL CONTROL
IC104 M5229P GRAPHIC EQUALIZER
IC202
IC201
IC201,202 AN6551F SPECTRUM ANALYZER B.P.F.
IC206
IC205
IC205,206 AN6551F SPECTRUM ANALIZER B.P.F.
IC208
IC207
IC207,208 HD14051BP MULTIPLEXER
IC204
IC203
IC203,204 LM324N SPECTRUM ANALIZER B.P.F.
IC56 LC6528C3664 MICRO COMPUTER (for REMOTE CONTROL)
Q6 UN4216TA RESET
Q52 2SA1309QR REMOTE/OFF
Q4 2SC3
Q1 2SC3940 REGULATO
IC1 AN78 REGUL
VR CONT
DECODER
A MAIN CIRCUIT

5 6 7 8 9 10 11 12 13 14

IC202 IC201,202 AN6551F SPECTRUM ANALYZER B.P.F. IC201

IC206 IC205,206 AN6551F SPECTRUM ANALIZER B.P.F. IC205

IC208 IC207

IC207,208 HD14051BP MULTIPLEXER

IC204 IC203,204 LM324N SPECTRUM ANALIZER B.P.F. IC203

IC105 M5229P GRAPHIC EQUALIZER

IC104 M5229P GRAPHIC EQUALIZER

IC56 LC6528C3664 MICRO COMPUTER (for REMOTE CONTROL)

Q52 2SA1309QRSTA REMOTE/OFF

Q6 UN4216TA RESET

Q4 2SC3311QRSTA RESET

Q5 UN4115TA RESET

IC1 AN78N05 REGULATOR

Q1 2SC3940AQSTA REGULATOR

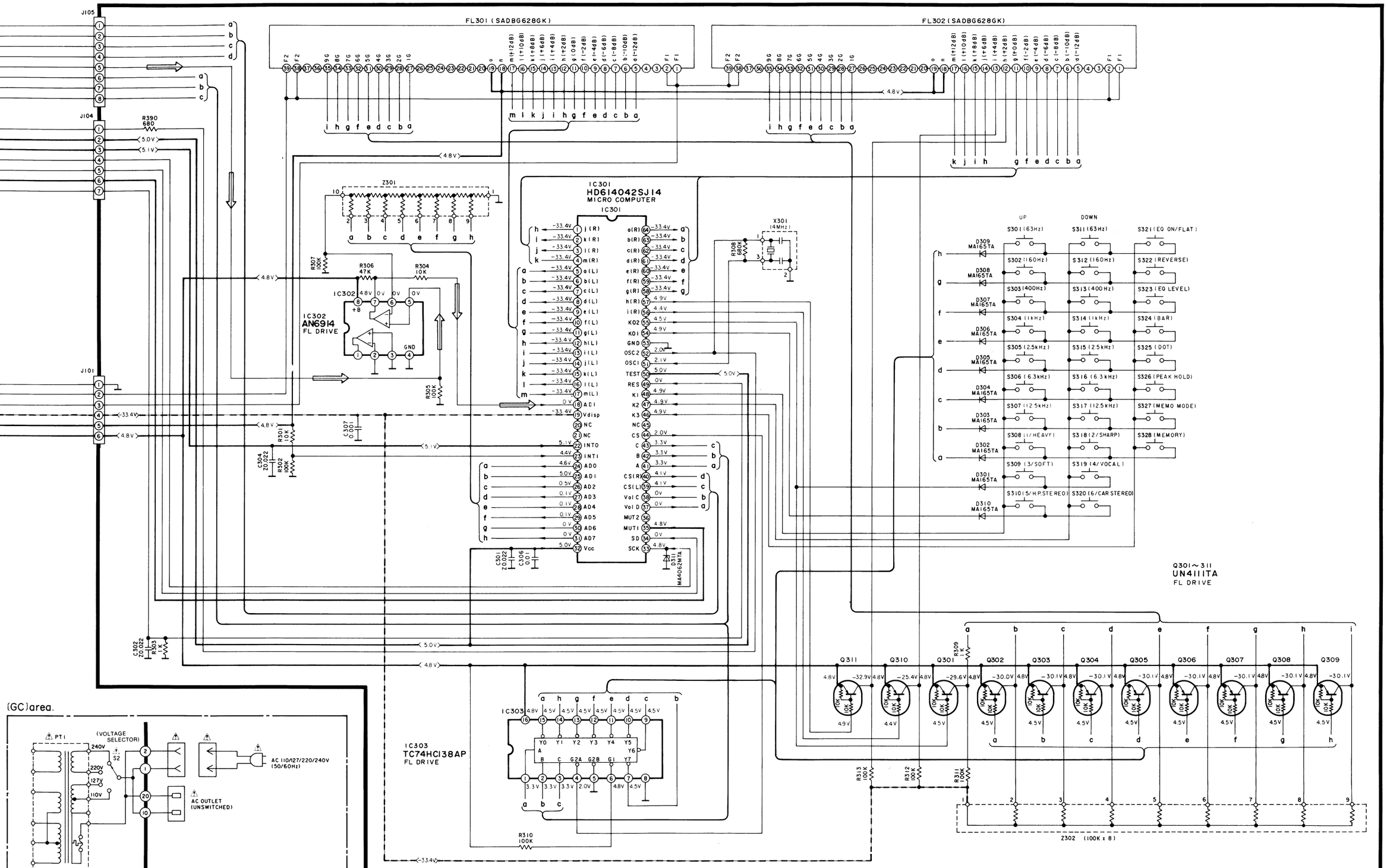
Q2 2SB1240PRTV6 REGULATOR

C POWER SWITCH CIRCUIT

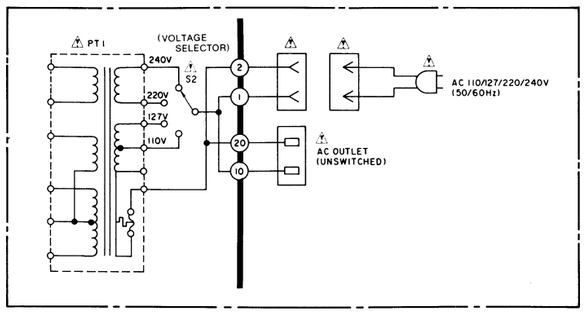
AC 220V ··· (E,E5,EG) area.
AC 240V ··· (EB,GN) area.
(50/60Hz)

Except (GN) area.

(E,E5,EG) areas.




(GC) area.




**B** MICRO COMPUTER / FL METER DRIVE / EQ BAND LEVEL CONTROL CIRCUIT





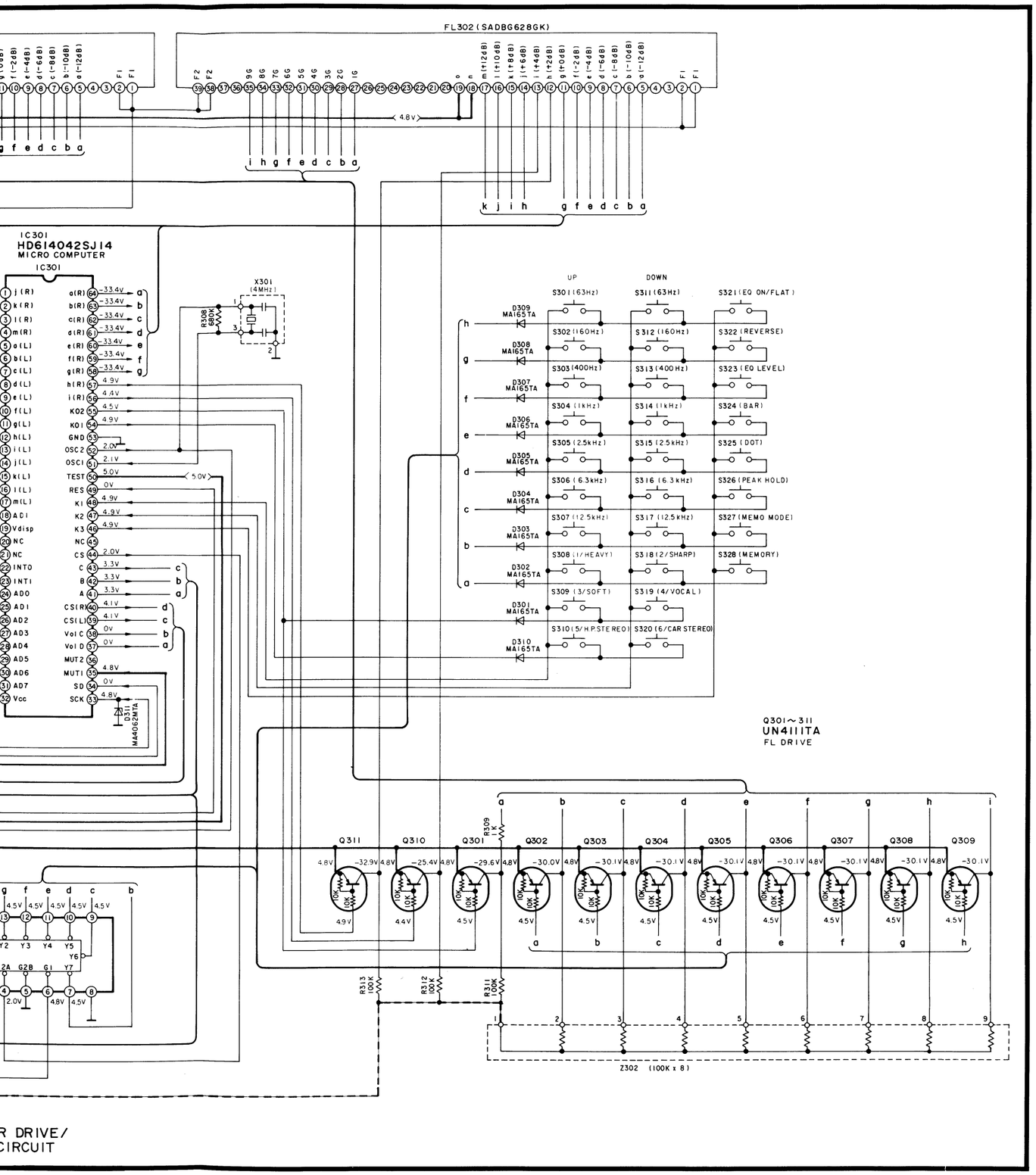
## SC

(This sc

**Notes:**

- S1
- S2
- S301~ 311~
- S308~ 318~
- S321
- S322
- S323~
- S327
- S328
- Indicat impeda depend
- Import Compo these
- ***Caution** IC and Secon
  - *Cov
  - *Gro
  - *Put
  - *Do

19 20 21 22 23 24




R DRIVE/
CIRCUIT



## ■ SCHEMATIC DIAGRAM (Parts list on pages 19~24.)

(This schematic diagram may be modified at any time with the development of new technology.)

**Notes:**

- **S1** : Power switch in "**on**" position.
- **S2** : Voltage selector switch in "**240V**" position. (For (GC) area.)
- **S301~307, 311~317** : Equalizer level control switches. [S301: 63Hz (up), S302: 160Hz (up), S303: 400Hz (up), S304: 1kHz (up), S305: 2.5kHz (up), S306: 6.3kHz (up), S307: 12.5kHz (up), S311: 63Hz (down), S312: 160Hz (down), S313: 400Hz (down), S314: 1kHz (down), S315: 2.5kHz (down), S316: 6.3kHz (down), S317: 12.5kHz (down)]
- **S308~310, 318~320** : Preset-memory switches. [S308: 1/HEAVY, S309: 3/SOFT, S310: 5/H.P. STEREO, S318: 2/CLEAR, S319: 4/VOCAL, S320: 6/CAR STEREO]
- **S321** : Equalization mode-select (EQ ON/FLAT) switch.
- **S322** : Reverse (REVERSE) switch.
- **S323~326** : Display mode-select (DISPLAY MODE) switches. [S323: EQ LEVEL, S324: BAR, S325: DOT, S326: PEAK HOLD]
- **S327** : Memory mode-select (MEMO MODE) switch.
- **S328** : Memory (MEMORY) switch.
- Indicated voltage values are the standard values for the unit measured by the DC electronic circuit tester (high-impedance) with the chassis taken as standard. Therefore, there may exist some errors in the voltage values, depending on the internal impedance of the DC circuit tester.

Source signal (Lch) ⟹ Spectrum analyzer signal

Positive voltage lines --- Negative voltage lines

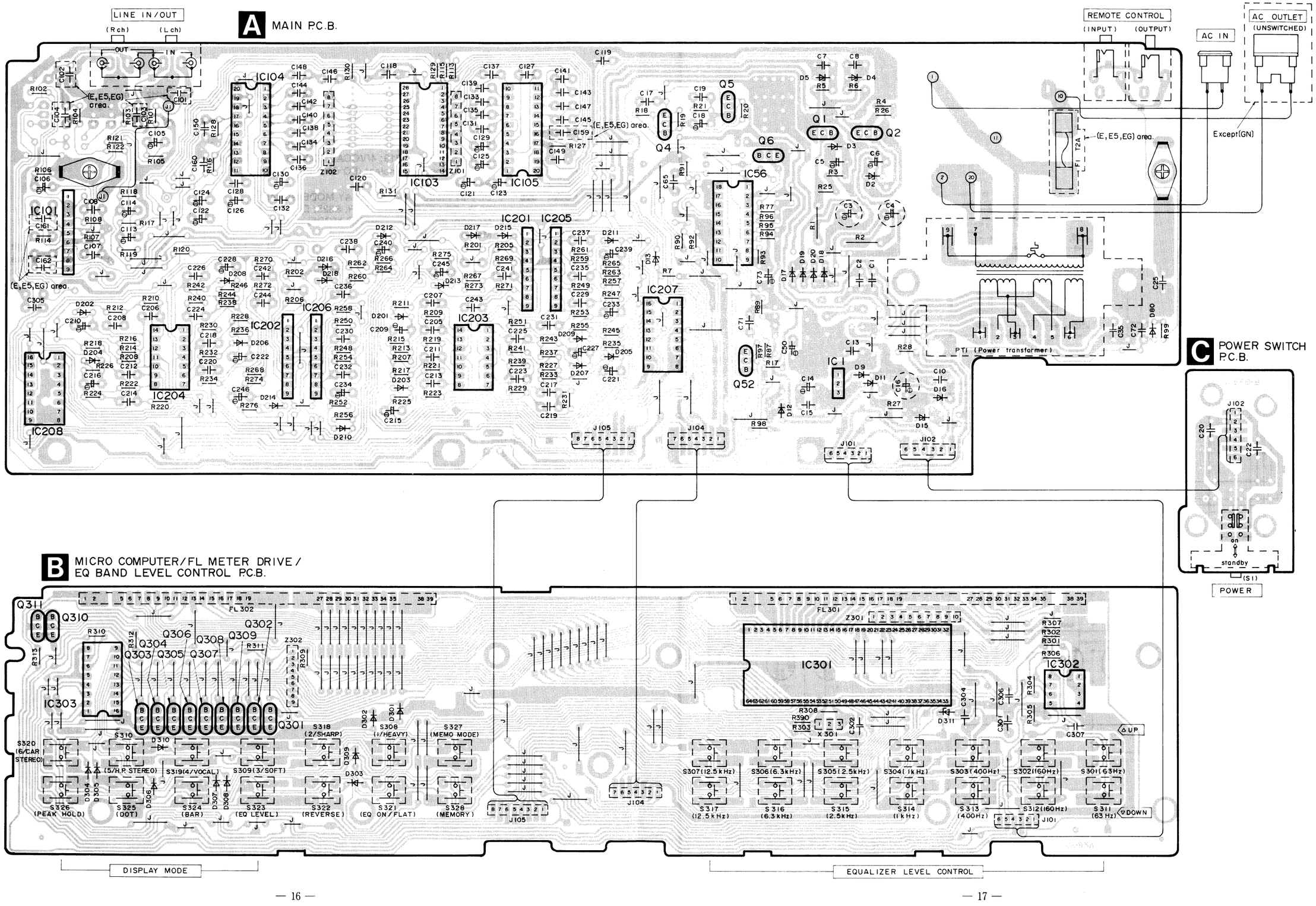
- Important safety notice:
  Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

**∗Caution!**

IC and LSI are sensitive to static electricity.
Secondary trouble can be prevented by taking care during repair.
∗Cover the parts boxes made of plastics with aluminum foil.
∗Ground the soldering iron.
∗Put a conductive mat on the work table.
∗Do not touch the legs of IC or LSI with the fingers directly.

SH-E65 SH-E65

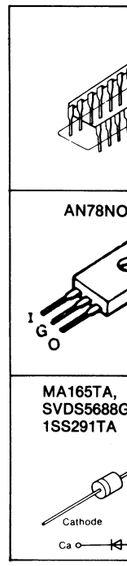
# ■ PRINTED CIRCUIT BOARDS AND WIRING CONNECTION DIAGRAM





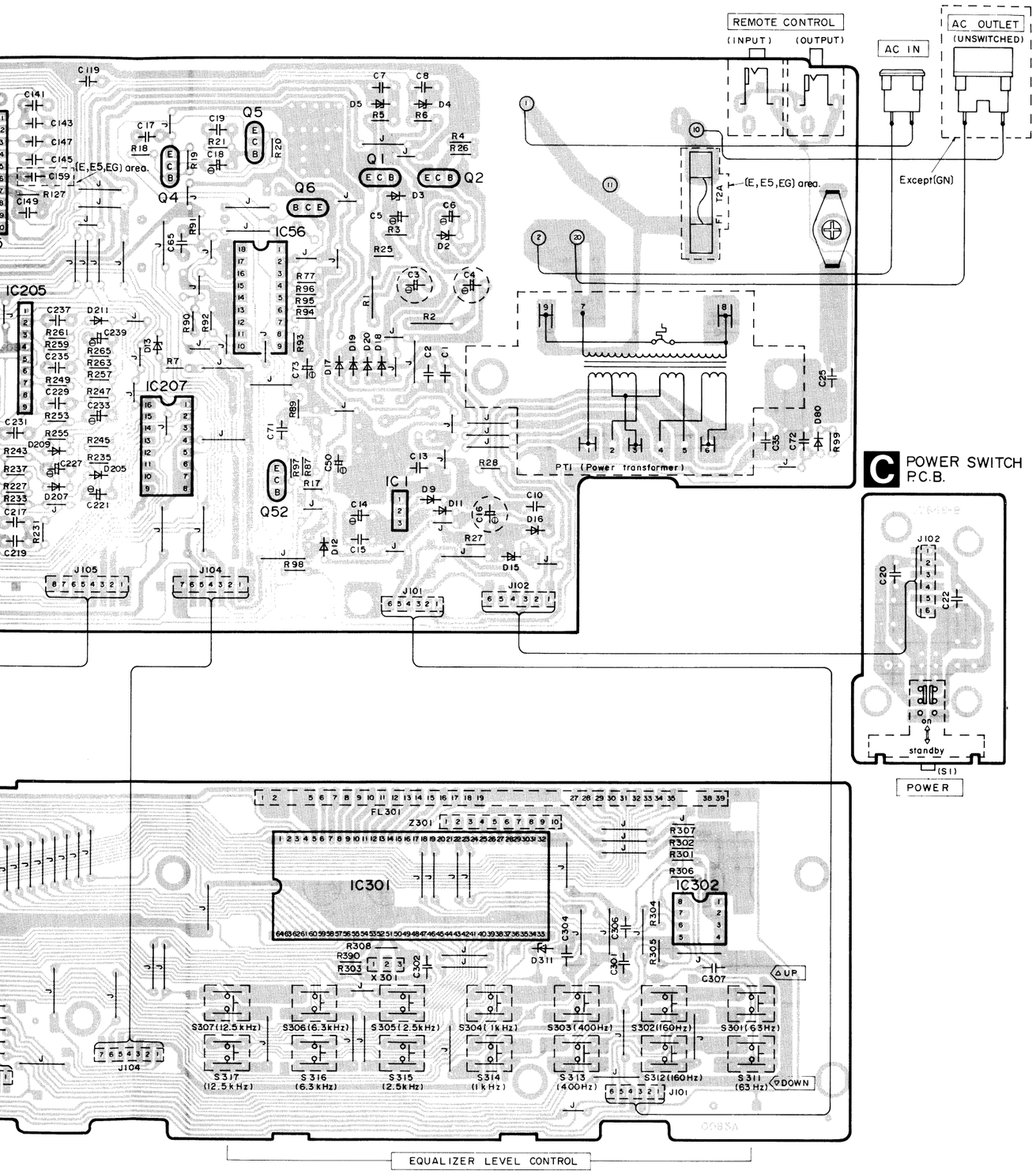



■ TERM



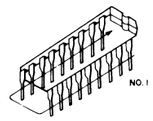
5 6 7 8 9

## N DIAGRAM



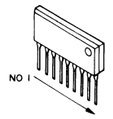



## ■ TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES

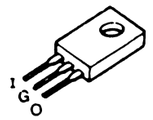



| | | | |
|---|---|---|---|
| M5229P | 20 Pin | LC6528C3664 | 18 Pin |
| LC7522 | 28 Pin | HD614042SJ14 | 64 Pin |
| HD14051BP | 16 Pin | AN6914 | 8 Pin |
| LM324N | 14 Pin | TC74HC138AP | 16 Pin |

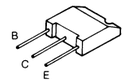
**AN6551F** — 9 Pin



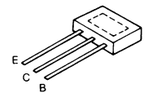

**AN78NO5**



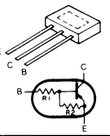

**2SB1240PRTV6**



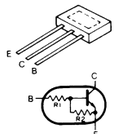

**2SC3311QRSTA, 2SA1309QRSTA**



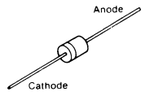

**UN4115TA, UN4111TA**



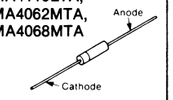

**UN4216TA**



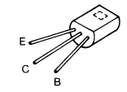

**MA165TA, SVDS5688GT3 1SS291TA**




**MA4150HTA, MA4075MTA, MA4110LTA, MA4062MTA, MA4068MTA**




**2SC3940AQSTA**



# ■ RESISTORS AND CAPACITORS

**Notes :** * Important safety notice :
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

**Numbering System of Resistor**

**Example:**

| ERD | 25 | F | J | 102 |
|---|---|---|---|---|
| Type | Wattage (1/4W) | Shape | Tolerance | Value (1KΩ) |

| ERX | 2 | AN | J | 471 |
|---|---|---|---|---|
| Type | Wattage (2W) | Shape | Tolerance | Value (470Ω) |

**Numbering System of Capacitor**

**Example:**

| ECKD | 1H | 102 | Z | F |
|---|---|---|---|---|
| Type | Voltage (50V) | Value (0.001μF) | Tolerance | Peculiarity |

| ECEA | 50 | M | 330 |
|---|---|---|---|
| Type | Voltage (50V) | Pecliarity | Value (33μF) |

● P=Pico-farads (pF), U=microfarads (μF).
● Resistance values are in ohms (Ω), unless specified otherwise, 1K=1,000Ω, 1M=1,000kΩ

| Resistor Type | | Wattage | | Tolerance |
|---|---|---|---|---|
| ERD | : Carbon | 10 : 1/8W | 12 : 1/2W | J : ±5% |
| ERG | : Metal Oxide | 14 : 1/4W | 25 : 1/4W | F : ±1% |
| ERQ | : Fuse Type Metal | 1A : 1W | 18 : 1/8W | G : ±2% |
| ERX | : Metal Film | S2 : 1/4W | S1 : 1/2W | J : ±5% |
| ERD L | : Carbon (chip) | 2F : 1/4W | 50 : 1/2W | K : ±10% |
| ERO K | : Metal Film (chip) | 2A : 2W | 3A : 3W | M : ±20% |
| ERC | : Solid | 6G : 1/10W | 8G : 1/8W | |
| ERF | : Incombustible Box-Shaped | | | |
| ERM | : Wire-Wound | | | |
| RRJ | : Cip Resistor | | | |
| ERJ | : Cip Resistor | | | |

| Capacitor Type | | Voltage | | Tolerance |
|---|---|---|---|---|
| ECE | : Electrolytic | 0J : 6.3V | 1A : 10V | K : ±10% |
| ECCD | : Ceramic | 1C : 16V | 1E : 25V | M : ±20% |
| ECKD | : Ceramic Capacitor | 1H : 50V | 1V : 35V | Z : +80 % −20 |
| ECQM | : Poyester | 50 : 50V | 05 : 50V | J : ±5% |
| ECQP | : Polypropylene | 2H : 500V | 2A : 100V | G : ±2% |
| ECG | : Ceramic | 1 : 100V | 1J : 63V | F : ±1% |
| ECEA N | : Non Polar Electrolytic | KC : 400V AC | | C : ±0.25pF |
| QCU | : Ceramic (Chip Type) | KC : 125V AC (UL) | | D : ±0.5pF |
| ECUX | : Ceramic (Chip Type) | | | |
| ECF | : Semiconductor | | | |
| EECW | : Liquid electrolyte double layer capacitor | | | |

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | RESISTORS | |
| | | | |
| R1, 2 | ERD2FCVJ4R7T | C. RESISTOR 1/4W 4.7 | ⚠ |
| R3, 4 | ERDS2TJ471T | C. RESISTOR 1/4W 470 | |
| R5, 6 | ERDS1FVJ271T | C. RESISTOR 1/2W 270 | ⚠ |
| R7 | ERDS2TJ273T | C. RESISTOR 1/4W 27K | |
| R17 | ERDS2TJ561T | C. RESISTOR 1/4W 560 | |
| R18 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R19~21 | ERDS2TJ332T | C. RESISTOR 1/4W 3.3K | |
| R25, 26 | ERDS2TJ471T | C. RESISTOR 1/4W 470 | |
| R27 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R28 | ERDS2TJ2R2T | C. RESISTOR 1/4W 2.2 | |
| R77 | ERDS2TJ222T | C. RESISTOR 1/4W 2.2K | |
| R87 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R89 | ERDS2TJ102T | C. RESISTOR 1/4W 1K | |
| R90, 91 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R92~97 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R98 | ERDS2TJ473T | C. RESISTOR 1/4W 47K | |
| R99 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R101~104 | ERDS2TJ102T | C. RESISTOR 1/4W 1K | |
| R105, 106 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R107, 108 | ERDS2TJ273T | C. RESISTOR 1/4W 27K | |
| R113, 114 | ERDS2TJ123T | C. RESISTOR 1/4W 12K | |
| R115, 116 | ERDS2TJ223T | C. RESISTOR 1/4W 22K | |

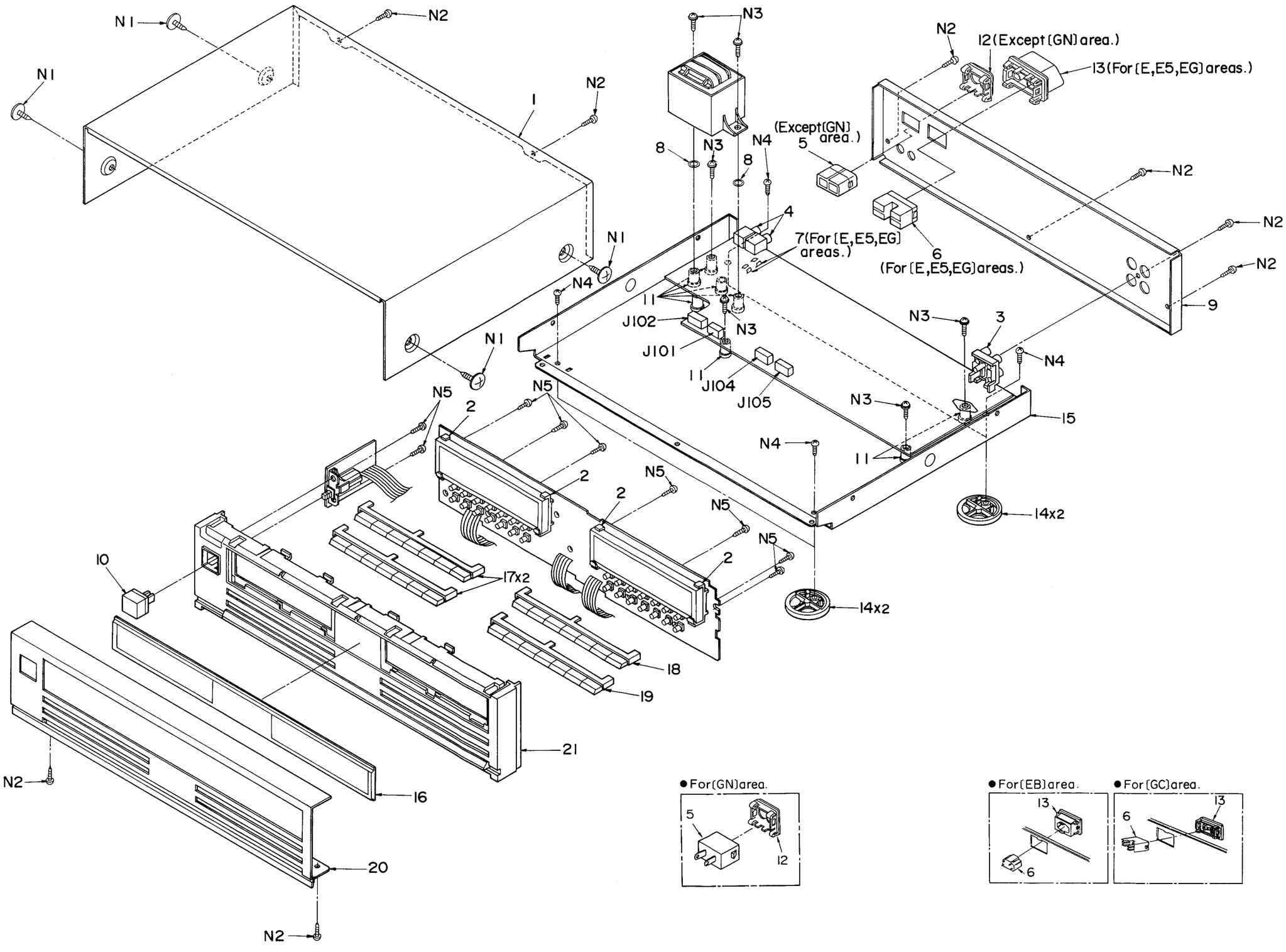
| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| R117~120 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R121, 122 | ERDS2TJ222T | C. RESISTOR 1/4W 2.2K | |
| R127, 128 | ERDS2TJ123T | C. RESISTOR 1/4W 12K | |
| R129, 130 | ERDS2TJ153T | C. RESISTOR 1/4W 15K | |
| R131 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R201, 202 | ERDS2TJ683T | C. RESISTOR 1/4W 68K | |
| R205, 206 | ERDS2TJ393T | C. RESISTOR 1/4W 39K | |
| R207, 208 | ERDS2TJ183T | C. RESISTOR 1/4W 18K | |
| R209, 210 | ERDS2TJ334T | C. RESISTOR 1/4W 330K | |
| R211, 212 | ERDS2TJ272T | C. RESISTOR 1/4W 2.7K | |
| R213, 214 | ERDS2TJ683T | C. RESISTOR 1/4W 68K | |
| R215, 216 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R217, 218 | ERDS2TJ822T | C. RESISTOR 1/4W 8.2K | |
| R219, 220 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R221, 222 | ERDS2TJ272T | C. RESISTOR 1/4W 2.7K | |
| R223, 224 | ERDS2TJ333T | C. RESISTOR 1/4W 33K | |
| R225, 226 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R227, 228 | ERDS2TJ822T | C. RESISTOR 1/4W 8.2K | |
| R229, 230 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R231, 232 | ERDS2TJ272T | C. RESISTOR 1/4W 2.7K | |
| R233, 234 | ERDS2TJ333T | C. RESISTOR 1/4W 33K | |
| R235, 236 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R237, 238 | ERDS2TJ822T | C. RESISTOR 1/4W 8.2K | |
| R239, 240 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R241, 242 | ERDS2TJ272T | C. RESISTOR 1/4W 2.7K | |
| R243, 244 | ERDS2TJ333T | C. RESISTOR 1/4W 33K | |
| R245, 246 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R247, 248 | ERDS2TJ822T | C. RESISTOR 1/4W 8.2K | |



| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| R249, 250 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R251, 252 | ERDS2TJ152T | C. RESISTOR 1/4W 1.5K | |
| R253, 254 | ERDS2TJ273T | C. RESISTOR 1/4W 27K | |
| R255, 256 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R257, 258 | ERDS2TJ822T | C. RESISTOR 1/4W 8.2K | |
| R259, 260 | ERDS2TJ154T | C. RESISTOR 1/4W 150K | |
| R261, 262 | ERDS2TJ821T | C. RESISTOR 1/4W 820 | |
| R263, 264 | ERDS2TJ333T | C. RESISTOR 1/4W 33K | |
| R265, 266 | ERDS2TJ563T | C. RESISTOR 1/4W 56K | |
| R267, 268 | ERDS2TJ682T | C. RESISTOR 1/4W 6.8K | |
| R269, 270 | ERDS2TJ124T | C. RESISTOR 1/4W 120K | |
| R271, 272 | ERDS2TJ681T | C. RESISTOR 1/4W 680 | |
| R273, 274 | ERDS2TJ273T | C. RESISTOR 1/4W 27K | |
| R275, 276 | ERDS2TJ683T | C. RESISTOR 1/4W 68K | |
| R301 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R302 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R303 | ERDS2TJ102T | C. RESISTOR 1/4W 1K | |
| R304 | ERDS2TJ103T | C. RESISTOR 1/4W 10K | |
| R305 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R306 | ERDS2TJ473T | C. RESISTOR 1/4W 47K | |
| R307 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R308 | ERDS2TJ684T | C. RESISTOR 1/4W 680K | |
| R309 | ERDS2TJ102T | C. RESISTOR 1/4W 1K | |
| R310~313 | ERDS2TJ104T | C. RESISTOR 1/4W 100K | |
| R390 | ERDS2TJ681T | C. RESISTOR 1/4W 680 | |
| | | | |
| | | CAPACITORS | |
| | | | |
| C1, 2 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C3, 4 | ECEA1VU221B | E. CAPACITOR 35V 220U | |
| C5, 6 | ECEA1EK100B | E. CAPACITOR 25V 10U | |
| C7, 8 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C10 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C13 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C14 | ECEA1EK100B | E. CAPACITOR 25V 10U | |
| C15 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C16 | ECEA1HU221B | E. CAPACITOR 50V 220U | |
| C17 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C18 | ECEA1HK4R7B | E. CAPACITOR 50V 4.7U | |
| C19 | ECFTD223KXL | S. CAPACITOR 25V 0.022U | |
| C20 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C22 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C25 | RCBS1H820KBY | C. CAPACITOR 50V 82P | |
| C35 | RCBS1H181KBY | C. CAPACITOR 50V 180P | |
| C50 | ECEA0JU332E | E. CAPACITOR 6.3V 3300U | |
| C65 | ECKT1H102KB | C. CAPACITOR 50V 1000P | |
| C71 | ECKT1H103ZF | C. CAPACITOR 50V 0.01U | |
| C72 | ECFTD472KXL | S. CAPACITOR 25V 4700P | |
| C73 | ECEA1EK470B | E. CAPACITOR 25V 47U | |
| C101~104 | RCBS1H221KBY | S. CAPACITOR 50V 220P | (E, E5, EG) |
| C105, 106 | ECEA1EK4R7B | E. CAPACITOR 25V 4.7U | |
| C107, 108 | ECKT1H101KB | C. CAPACITOR 50V 100P | |

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| C113, 114 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C118 120 | ECKT1H1032F | C. CAPACITOR 50V 0.01U | |
| C121, 122 | ECEA1HK010B | E. CAPACITOR 50V 1U | |
| C123, 124 | ECEA1HKR22B | E. CAPACITOR 50V 0.22U | |
| C125, 126 | ECEA1HKR47B | E. CAPACITOR 50V 0.47U | |
| C127, 128 | ECFTD823KXL | S. CAPACITOR 25V 0.082U | |
| C129, 130 | ECEA1HKR15B | E. CAPACITOR 50V 0.15U | |
| C131, 132 | ECFTD333KXL | S. CAPACITOR 25V 0.033U | |
| C133, 134 | ECFTD683KXL | S. CAPACITOR 25V 0.068U | |
| C135, 136 | ECFTD153KXL | S. CAPACITOR 25V 0.015U | |
| C137, 138 | ECFTD273KXL | S. CAPACITOR 25V 0.027U | |
| C139, 140 | ECFTD562KXL | S. CAPACITOR 25V 5600P | |
| C141, 142 | ECFTD123KXL | S. CAPACITOR 25V 0.012U | |
| C143, 144 | ECKT1H222KB | C. CAPACITOR 50V 2200P | |
| C145, 146 | ECFTD472KXL | S. CAPACITOR 25V 4700P | |
| C147, 148 | ECFTD122KXL | S. CAPACITOR 25V 1200P | |
| C149, 150 | ECKT1H121KB | C. CAPACITOR 50V 120P | |
| C159, 160 | RCBS1H101KBY | C. CAPACITOR 50V 100P | (E, E5, EG) |
| C161 | ECBT1E1032F5 | C. CAPACITOR 25V 0.01U | (E, E5, EG) |
| C162 | ECBT1H1032F5 | C. CAPACITOR 50V 0.01U | (E, E5, EG) |
| C205~208 | ECFTD393KXL | S. CAPACITOR 25V 0.039U | |
| C209, 210 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C211~214 | ECFTD333KXL | S. CAPACITOR 25V 0.033U | |
| C215, 216 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C217~220 | ECFTD123KXL | S. CAPACITOR 25V 0.012U | |
| C221, 222 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C223~226 | ECFTD472KXL | S. CAPACITOR 25V 4700P | |
| C227, 228 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C229~232 | ECKT1H222KB | C. CAPACITOR 50V 2200P | |
| C233, 234 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C235~238 | ECKT1H821KB | C. CAPACITOR 50V 820P | |
| C239, 240 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C241~244 | ECKT1H561KB | C. CAPACITOR 50V 560P | |
| C245, 246 | ECEA1HK3R3B | E. CAPACITOR 50V 3.3U | |
| C301, 302 | ECBT1E223ZF5 | C. CAPACITOR 25V 0.022U | |
| C304 | ECBT1E223ZF5 | C. CAPACITOR 25V 0.022U | |
| C305 | RCBS1H181KBY | C. CAPACITOR 50V 180P | |
| C306 | ECBT1C103NS5 | C. CAPACITOR 16V 0.01U | |
| C307 | ECBT1H102KB5 | C. CAPACITOR 50V 0.001U | |

## ■ EXPLODED VIEW




● For(GN)area.




● For(EB)area.




● For(GC)area.

# ■ REPLACEMENT PARTS LIST

Notes : * Important safety notice:
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Remarks columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| | | | |
| | | CABINET AND CHASSIS | |
| | | | |
| 1 | RKM0018A-K | CABINET | |
| 2 | SHRK963 | FL HOLDER | |
| 3 | SJF3057-8N | TERMINAL INPUT/OUTPUT | |
| 4 | SJJK47 | JACK, REMOTE CONTROL | |
| 5 | SJS9231-1B | AC INLET | (E, E5, EG, EB, GC) ⚠ |
| 5 | SJS9234B | AC INLET | (GN) ⚠ |
| 6 | SJS9333B | AC OUTLET | (E, E5, EB) ⚠ |
| 6 | SJS9332B | AC OUTLET | (EB) ⚠ |
| 6 | SJS9233B | AC OUTLET | (GC) ⚠ |
| 7 | SJT347 | FUSE HOLDER | (E, E5, EG) |
| 8 | SUD444 | WASHER | |
| 9 | RGR0009C-B | REAR PANEL | |
| 10 | SBC666-1 | BUTTON, POWER | |
| 11 | SHE187-2 | SPACER | |
| 12 | SJS9231A | AC INLET COVER | (E, E5, EB, EG, GC) |
| 12 | SJS9234A | AC INLET COVER | (GN) |
| 13 | SJS9332A | AC OUTLET COVER | (EB) |
| 13 | SJS9233A | AC OUTLET COVER | (GC) |
| 13 | SJS9333A | AC OUTLET COVER | (E, E5, EG) |
| 14 | SKL307 | FOOT | |
| 15 | SKUK242 | CHASSIS | |
| 16 | RGK0035C | FL FILTER | |
| 17 | SBCK82A | BUTTON, UP/DOWN | |
| 18 | SBCK82B | BUTTON, MEMORY | |
| 19 | SBCK82C | BUTTON, FUNCTION | |
| 20 | RYP0091 | FRONT PANEL ASS'Y | |
| 21 | SGXK141 | GRILLE | |
| | | | |
| | | SCREWS | |
| | | | |
| N1 | SNE2129-1 | SCREW | |
| N2 | XTBS3+8JFZ1 | SCREW | |
| N3 | XTB3+20J | SCREW | |
| N4 | XTB3+8G | SCREW | |
| N5 | XTB3+8JFZ | SCREW | |
| | | | |
| | | ACCESSORIES | |
| | | | |
| A1 | RQF0248 | INSTRUCTION BOOK | (E, E5) |
| A1 | RQF0250 | INSTRUCTION BOOK | (EB) |
| A1 | RQF0249 | INSTRUCTION BOOK | (EG) |
| A1 | RQF0251 | INSTRUCTION BOOK | (GC) |
| A1 | RQF0252 | INSTRUCTION BOOK | (GN) |
| A2 | SFDAC05E03 | POWER CORD | (E, E5, EG) ⚠ |

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| A2 | SJA188 | POWER CORD | (EB) ⚠ |
| A2 | RJA0004 | POWER CORD | (GC) ⚠ |
| A2 | SJA190 | POWER CORD | (GN) ⚠ |
| A3 | SJP2249-3 | OUTPUT CORD | |
| A4 | SJP2257T | REMOTE CONTROL CORD | |
| A5 | SJP9215 | AC PLUG ADAPTOR | (GC) ⚠ |
| | | | |
| | | PACKING MATERIAL | |
| | | | |
| P1 | RPG0262 | CARTON BOX | |
| P2 | RPN0181A | PAD (L) | |
| P3 | RPN0181B | PAD (R) | |
| P4 | SPSD152 | ACCESSORY BOX | |
| P5 | SPP753 | PROTECTION BAG | |

Notes : * Important safety notice:
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* Bracketed indications in Remarks columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| | | | |
| | | INTEGRATED CIRCUITS | |
| | | | |
| IC1 | AN78N05 | IC, REGULATOR | |
| IC56 | LC6528C3664 | IC, MICROCOMPUTER | |
| IC101 | AN6551F | IC, BUFFER AMP | |
| IC103 | LC7522 | IC, BAND LEVEL CONT. | |
| IC104, 105 | M5229P | IC, GRAPHIC EQ. | |
| IC201, 202 | AN6551F | IC, S.A. B.P.F. | |
| IC203, 204 | LM324N | IC, S.A. B.P.F. | |
| IC205, 206 | AN6551F | IC, S.A. B.P.F. | |
| IC207, 208 | HD14051BP | IC, MPX | |
| IC301 | HD614042SJ14 | IC, MICROCOMPUTER | |
| IC302 | AN6914 | IC, FL DRIVE | |
| IC303 | TC74HC138AP | IC, FL DRIVE | |
| | | | |
| | | TRANSISTORS | |
| | | | |
| Q1 | 2SC3940AQSTA | TRANSISTOR | |
| Q2 | 2SB1240PRTV6 | TRANSISTOR | |
| Q4 | 2SC3311QRSTA | TRANSISTOR | |
| Q5 | UN4115TA | TRANSISTOR | |
| Q6 | UN4216TA | TRANSISTOR | |
| Q52 | 2SA1309QRSTA | TRANSISTOR | |
| Q301~311 | UN4111TA | TRANSISTOR | |
| | | | |
| | | DIODES | |
| | | | |
| D2, D3 | MA4150HTA | DIODE | |
| D4 | MA4075MTA | DIODE | |
| D5 | MA4068MTA | DIODE | |
| D9 | MA165TA | DIODE | |
| D11 | MA165TA | DIODE | |
| D12 | 1SS291TA | DIODE | |
| D13 | MA4110LTA | DIODE | |
| D15 | MA4110LTA | DIODE | |
| D16~20 | SVDS5688GT3 | DIODE | ⚠ |
| D80 | MA165TA | DIODE | |
| D201~218 | MA165TA | DIODE | |
| D301~310 | MA165TA | DIODE | |
| D311 | MA4062MTA | DIODE | |
| | | | |
| | | COMBINATION PARTS | |
| | | | |
| Z101, 102 | EXBF8E224J | COMBINATION PART | |
| Z301 | EXBF10L795J | COMBINATION PART | |
| Z302 | EXBZ9E104J | COMBINATION PART | |

| Ref. No. | Part No. | Part Name & Description | Remarks |
|---|---|---|---|
| | | | |
| | | OSCILLATOR | |
| | | | |
| X301 | EF0FC4004A4 | OSCILLATOR | |
| | | | |
| | | FUSE | |
| | | | |
| F1 | XBA2C20TB0 | FUSE (250V, T2A) | (E, E5, EG) ⚠ |
| | | | |
| | | DISPLAY TUBE | |
| | | | |
| FL301, 302 | SADBG628GK | DISPLAY TUBE | |
| | | | |
| | | SWITCHES | |
| | | | |
| S1 | SSHK81 | SW, POWER | ⚠ |
| S2 | SSR187-1 | SW, VOLTAGE SELECTOR | (GC) ⚠ |
| S301~328 | EVQQB007K | SW, CONTROL | |
| | | | |
| | | JACKS | |
| | | | |
| J101 | SJSD0605 | SOCKET | |
| J102 | SJT30643-V | CONNECTOR | |
| J104 | SJSD0705 | SOCKET | |
| J105 | SJSD0805 | SOCKET | |
| | | | |
| | | TRANSFORMERS | |
| | | | |
| PT1 | SLTK5K17 | POWER TRANSFORMER | (E, E5, EG) ⚠ |
| PT1 | SLTK5K18 | POWER TRANSFORMER | (EB, GN) ⚠ |
| PT1 | SLTK5K19 | POWER TRANSFORMER | (GC) ⚠ |



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